



## THE LIFETIME SURVEILLANCE OF ASTRONAUT HEALTH

# Newsletter

Fall 2012

Volume 18, Issue 2

**Editor's Note:** This edition of the newsletter focuses on various programs and services provided by and in conjunction with the Lifetime Surveillance of Astronaut Health (LSAH). We feel it is important to keep you up-to-date with current program offerings, data uses, and upcoming organizational changes. Additionally, please see the last page for a slightly truncated list of publications that have resulted from astronaut data provided by LSAH.

## Individual Exposure Profiles: Documenting and Evaluating the Risks to Astronaut Health

By: Jessica Garcia, MPH

This spring, the Lifetime Surveillance of Astronaut Health (LSAH) began a project to compile and verify astronauts' occupational exposures to hazards such as intense noise, injuries, and radiation. These Individual Exposure Profiles (IEPs) will document exposures over each astronaut's lifetime, with specific emphasis on those hazards unique to working at NASA. A more individualized health care protocol can then be created for each astronaut based on their specific risks. The project was conceived in an attempt to pull together hazard exposure and related outcome information from a variety of sources into one concise document for each astronaut. Information is gathered from sources such as the electronic medical record (EMR), the Shuttle Data Archive, the LSAH data base, the Life Sciences Data Archive (LSDA), mission and training documents, and biographical data. These data are put into a summary form that guides a one-time in-person interview, which is conducted by an epidemiologist at the time of the annual exam. This conference gives each astronaut a chance to verify the facts and add missing details.

LSAH is also interested in pre- and post-NASA

exposures such as military service, previous work or childhood exposures, and current hobbies. Some astronauts may wonder why there are questions about non-NASA-related experiences, but these exposures are what could be considered a baseline. Without a comprehensive understanding of the whole risk profile of an astronaut, we can't properly assess the risk of space flight to current and future crewmembers. Additionally, these IEPs may help guide future attempts to secure legislation for federal funding of retired astronauts' healthcare, which requires a thorough understanding of the lifetime risks to astronaut health.

Currently, the focus is on completing IEPs for retired astronauts returning to JSC for their annual physicals, especially those who do not reside in the Houston metro area. Contact is most often made through email a week or two prior to the exam, and the interview generally occurs immediately following the physical in the Flight Medicine Clinic offices. While participation is not mandatory, LSAH hopes every astronaut will be enthusiastic to take part and help us better tailor our exams and, in the long run, ensure the health of the entire astronaut corps.

# Ready, Set... GO! for Fitness Assessments

By: Mitzi Laughlin, PhD

**A**lthough you have retired from the active astronaut corps, you can still participate in the annual fitness testing provided in conjunction with your physical. The clinic no longer performs the treadmill test, however, you can track your health by participating in a fitness assessment with the Astronaut Strength, Conditioning and Rehabilitation (ASCR) group. The test is offered to provide a method for tracking fitness as well as a comparison of your current performance to when you were an active astronaut. The fitness assessment consists of the following tests:

- Aerobic capacity (1.5 mile run, bike, or treadmill)
- Hand grip strength
- Sit-and-reach flexibility test
- Push-ups (2 minutes)
- Sit-ups (2 minutes)
- Pull-ups
- Shoulder mobility and impingement test

Not quite ready for the entire test? It's OK to opt out of one or more of the tests if you are injured or just not feeling up to it. Let the ASCRs know what you are comfortable with and they will perform just those sections of the test. After discussing your results, an ASCR can help plan your workouts to improve on weak areas and increase your strengths even further.

If you're not interested in the fitness assessment, you can still use the astronaut gym during the week of your annual exam. The specific rules of participation in the fitness assessment and use of the gym are outlined in the handout included in the retiree annual exam invitation package sent by Denise Patterson. These are also available from the nurses on the day of your exam, or by request.

Additionally, when you come for your fitness assessment (or just to workout), the ASCRs can give you a full tour of the new Columbia Center gym. The formal name is the Columbia Center for Human Spaceflight Performance and Research but it's still known as the AstroGym. Throw away all the old memories of Building 260A and prepare to be amazed! There's an open gym area, free weights, machine weights, cardio area, lap pool, and therapy pools as well as new locker rooms, offices, rehabilitation/therapy room, and ISS exercise hardware room. There's lots of wide open space to accommodate multiple individuals working out at the same time.

To schedule a fitness assessment when you are at JSC for your physical, call or email Bruce Nieschwitz at 281-483-9598 or [bruce.e.nieschwitz@nasa.gov](mailto:bruce.e.nieschwitz@nasa.gov). The fitness assessment will be scheduled after you complete your clinic physical so as not to conflict with those medical tests and to obtain physician sign-off, if required. Don't forget to bring workout clothes and shoes to the gym, but the ASCRs will take care of the rest. We'll see you soon at the gym!

## For Your Information

If you want a copy of your exam results, please complete and sign a release form while you are visiting the Clinic for your examination. The form is called *Authorization for Disclosure of Protected Health Information for Continuity of Care*.

## ...and Ours

If you have a new address, phone number, or email please let us know by calling (281) 244-5195 or (281) 483-7999. You may also write us at:

Lifetime Surveillance of Astronaut Health  
Flight Medicine Clinic/SD38  
Johnson Space Center/NASA  
2101 NASA Parkway  
Houston, TX 770058-3696

Or email us at: [jsc-lsah@mail.nasa.gov](mailto:jsc-lsah@mail.nasa.gov)

# **The Lifetime Surveillance of Astronaut Health Repository (LSAH-R): Support for Current and Future Research Studies**

By: Lesley R. Lee, MS

**W**ith the accumulation of U.S. space flight experience, many aspects of the effects of space flight on humans have been determined. However, there is a continuing need to combine research and medical data sets to better understand the immediate and long-term effects of space flight. The Lifetime Surveillance of Astronaut Health Repository (LSAH-R) has been established to coordinate the archiving, integration, analytical support, and release of data for current and future research studies that require astronaut medical data. LSAH currently maintains an archive of astronaut medical data in several different secured locations such as the electronic medical record (EMR), LSAH database, paper clinic records, and laboratory medical records.

The data associated with this project include medical information recorded during each astronaut's career as a NASA astronaut or payload specialist and from annual LSAH examinations after retirement from the astronaut corps. These records may include, but are not limited to, medical data pertaining to astronaut selection, space flight training, Flight Medicine Clinic visits, pre/in-/postflight medical requirements, debriefs, Astronaut Strength, Conditioning, and Rehabilitation (ASCR) records, Neutral Buoyancy Laboratory medical exams, and periodic medical exams. These data are stored permanently per NASA records retention policies.

All medical data collected on astronauts for clinical, mission, and occupational health surveillance purposes are protected health information. Aside from direct clinical care applications, the use of astronaut

medical data generally requires LSAH epidemiologists to group the data to make it un-identifiable or to obtain informed consent for each use of possibly identifiable information. Frequent requests to use this data may cause inconvenience to astronaut participants and extensive use of NASA resources. The LSAH-R project provides each astronaut the opportunity to direct the use of their medical data for approved research investigations. Even with this consent, LSAH will adhere to the requirements of the Privacy Act and will release only the minimum necessary information to answer the research question(s) of each NASA Institutional Review Board-approved study.

In order to obtain informed consent, a briefing will be requested with each active and retired astronaut. LSAH staff will provide a thorough review of the types of data held in LSAH systems and the options for permitting use of their data. A 'tiered' consent form will be provided for signature that allows use of all, none (requiring specific consent for each study requesting their data), or some of the data. A Medical Data Authorization Checklist (MDAC) showing the categories and examples of archived medical data will be reviewed, initialed by the astronaut to specify data categories permitted for release, and signed. This consent will be reviewed at intervals not more than five years (sooner if required or if requested by the astronaut) to assure continuing agreement or to document changes to the initial consent.

LSAH is currently working to finalize the details of the consent process, and expects to begin briefings with active and retired astronauts in the next six months.

# What Can the Lifetime Surveillance of Astronaut Health (LSAH) Program Do For You When You Retire From the Astronaut Corps?

By: Denise Patterson

**H**ave you recently retired from the astronaut corps, have you transitioned to a management position or plan to retire in the near future? Have you thought about, “What happens with my annual physical examinations now that my status at the Johnson Space Center has changed”? We have the answers for you. The Lifetime Surveillance of Astronaut Health (LSAH) program will take over facilitating your annual physical exams. From 1989 to 2010, we invited retired astronauts to return to JSC each year for a physical examination as part of the research-focused Longitudinal Study of Astronaut Health. Now that we have transitioned to the new Lifetime Surveillance of Astronaut Health program, we will continue to work with you to coordinate your exam each year.

The core element of the new occupational surveillance program is the annual medical exam. This exam, as during your employment by NASA, consists of a complete preventive health-focused physical exam, a comprehensive laboratory workup, an eye exam, a bone densitometry or DXA scan (every three years or as clinically indicated), and an audiology consultation at the Flight Medicine Clinic. You may be invited to participate in extra activities, such as a fitness assessment, or you may be offered extra screening exams based on your individual medical and exposure history; of course these are voluntary and you may decline, but your participation in each aspect is highly recommended for the future of the astronaut program. Wyle is the support contractor for the Flight Medicine Clinic and will handle the paperwork and

payment procedures for NASA if you do not live in the immediate Houston area. If you transition from astronaut to active military or civil service, those expenses will be handled through NASA orders in accordance with federal guidelines. Otherwise, expenses are handled directly between you and Wyle’s LSAH staff. Your exam can normally be completed in one day, therefore the general reimbursement allowance for the annual exam is for one night of lodging expenses, rental car, per diem, coach class airfare, and most other out of pocket expenses. However, if the exam requires a second day, reimbursement will be made for the additional expenses.

In order to ensure continuity of your care and to provide your Flight Medicine Clinic (FMC) physician a more complete picture of your health, each year we will request that you complete a new Authorization for Disclosure of Protected Health Information form so we can obtain medical records from medical providers that you see outside of JSC. We will request these records well in advance of your scheduled annual appointment in the FMC to enable the FMC physician to review your full medical history prior to your visit with us. A more detailed article on this topic, “Your One-Stop-Shop for Medical Records,” was published in the Spring, 2012 LSAH Newsletter. You may refer to that article by going to [http://lsda.jsc.nasa.gov/docs/research/LSAH\\_nav.cfm](http://lsda.jsc.nasa.gov/docs/research/LSAH_nav.cfm). The LSAH program appreciates your continued participation and we look forward to seeing you each year.

*Do you have a suggestion for a newsletter article? We’d love to hear about it!  
Send suggestions, comments, or questions to: [jessica.garcia@nasa.gov](mailto:jessica.garcia@nasa.gov)*

# Visual Impairment/Intracranial Pressure (VIIP) Update

By: Sara Perry, MA, MPH and Lesley R. Lee, MS

The spring edition of the LSAH newsletter included several articles about the NASA Visual Impairment Intracranial Pressure (VIIP) team efforts to learn more about certain related physiological changes observed during and after space flight. We wanted to update you about this ongoing effort.

LSAH epidemiologists have been working with the VIIP project team, crew surgeons, and subject matter experts in optometry, ophthalmology, internal and cardiovascular medicine, neurosurgery, and radiology to continue surveillance and risk factor analyses of the VIIP findings in our astronaut corps. LSAH personnel have processed 33 separate data requests for vision and other health measurements such as exercise, cardiovascular parameters and blood variables, and health outcomes. These data have been used to analyze associations between affected and non-affected crewmembers, short- and long-duration flyers, men and women, and other subsets of the population.

The research VIIP project team, headed by Christian Otto, MD, compiled the LSAH data and other known evidence into the VIIP Evidence Book, available at <http://humanresearchroadmap.nasa.gov/evidence/reports/VIIP.pdf>. This document focuses on the three systems of the body thought to be involved with the VIIP process: the cardiovascular system, the visual system, and the central nervous system. The VIIP Evidence Book also touches on other potential contributing factors, including carbon dioxide exposure, sodium alterations, exercise, biomarkers and genetic predisposition. There may also be relationships between certain lifestyle-related risk factors (blood pressure, diet, exercise) and the VIIP phenomenon.

On the clinical side, LSAH has been collaborating with Dr. William Tarver and other Space Medicine physicians to refine the VIIP case definition and establish grades of severity. Our analyses are also enabling refinement of the Clinical Practice Guidelines, which help our physicians monitor and treat affected crewmembers. Additional tests have recently been adopted to further understand the effects of VIIP; these include high resolution magnetic resonance imaging, ultrasonography, and optical coherence tomography. The new information obtained from these tests will add to our knowledge of the fundamental processes at work in this condition.

Lastly, the Human Research Program funded an initial round of ten new research studies this summer, with another round of proposals solicited for 2013 funding.

The research on what causes these physiological changes continues to progress steadily, and the ongoing efforts of LSAH and in-house experts are successfully enhancing the work that is being done. All parties involved are working to discover the causes of this condition in order to mitigate their effects and protect the health of all astronauts.

*For more information, check out the  
VIIP Wikipedia page:*

<http://en.wikipedia.org/wiki/VIIP>



## For Your Reference: Publications Derived from LSAH Data

- [Kramer LA, Sargsyan AE, Hasan KM, Polk JD, Hamilton DR. Orbital and Intracranial Effects of Microgravity: Findings at 3-T MR Imaging. Radiology. 2012 Jun;263\(3\):819-827.](#)
- [Chylack LT Jr, Feiveson AH, Peterson LE, Tung WH, Wear ML, Marak LJ, Hardy DS, Chappell LJ, Cucinotta FA. NASCA Report 2: Longitudinal Study of Relationship of Exposure to Space Radiation and Risk of Lens Opacity. Radiat Res. 2012 Jul;178\(1\):25-32.](#)
- [Zwart SR, Gibson CR, Mader TH, Ericson K, Ploutz-Snyder R, Heer M, Smith SM. Vision Changes After Spaceflight are Related to Alterations in Folate- and Vitamin B-12-Dependent One-Carbon Metabolism. J Nutr. 2012 Mar;142\(3\):427-431.](#)
- [Mader TH, Gibson CR, Pass AF, Kramer LA, Lee AG, Fogarty J, Tarver WJ, Dervay JP, Hamilton DR, Sargsyan A, Phillips JL, Tran D, Lipsky W, Choi J, Stern C, Kuyumjian R, Polk JD. Optic Disc Edema, Globe Flattening, Choroidal Folds, and Hyperopic Shifts Observed in Astronauts after Long-Duration Space Flight. Ophthalmology. 2011 Oct;118\(10\):2058-2069.](#)
- [Minard CG, de Carvalho MF, Iyengar MS. Optimizing Medical Resources for Spaceflight Using the Integrated Medical Model. Aviat Space Environ Med. 2011 Sep;82\(9\):890-894.](#)
- [Smith SM, Zwart SR, McMonigal KA, Huntoon CL. Thyroid Status of Space Shuttle Crewmembers: Effects of Iodine Removal. Aviat Space Environ Med. 2011 Jan;82\(1\):49-51.](#)
- [Johnston SL, Campbell MR, Scheuring R, Feiveson AH. Risk of Herniated Nucleus Pulposus Among U.S. Astronauts. Aviat Space Environ Med. 2010 Jun;81\(6\):566-574.](#)
- [Chylack LT Jr, Peterson LE, Feiveson AH, Wear ML, Manuel FK, Tung WH, Hardy DS, Marak LJ, Cucinotta FA. NASA Study of Cataract in Astronauts \(NASCA\). Report 1: Cross-Sectional Study of the Relationship of Exposure to Space Radiation and Risk of Lens Opacity. Radiat Res. 2009 Jul;172\(1\):10-20.](#)
- [Scheuring RA, Mathers CH, Jones JA, Wear ML. Musculoskeletal Injuries and Minor Trauma in Space: Incidence and Injury Mechanisms in U.S. Astronauts. Aviat Space Environ Med. 2009 Feb;80\(2\):117-124.](#)
- [Jones JA, McCarten M, Manuel K, Djojonegoro B, Murray J, Feiverson A, Wear M. Cataract Formation Mechanisms and Risk in Aviation and Space Crews. Aviat Space Environ Med. 2007 April;78\(4 Suppl\):A56-A66.](#)
- [Pietrzyk RA, Jones JA, Sams CF, Whitson PA. Renal Stone Formation Among Astronauts. Aviat Space Environ Med. 2007 Apr;78\(4 Suppl\):A9-A13.](#)
- [Hamilton DR, Murray JD, Ball CG. Cardiac Health for Astronauts: Coronary Calcification Scores and CRP as Criteria for Selection and Retention. Aviat Space Environ Med. 2006 Apr;77\(4\):377-387.](#)
- [Summers RL, Johnston SL, Marshburn TH, Williams DR. Emergencies in Space. Ann Emerg Med. 2005 Aug;46\(2\):177-184.](#)
- [Cucinotta FA, Manuel FK, Jones J, Iszard G, Murray JD, Djojonegoro BM, Wear ML. Space Radiation and Cataracts in Astronauts. Radiat Res. 2001 Nov;156\(5 Pt 1\):460-466.](#)
- [McMonigal KA, Braverman LE, Dunn JT, Stanbury JB, Wear ML, Hamm PB, Sauer RL, Billica RD, Pool SL. Thyroid Function Changes Related to Use of Iodinated Water in the U.S. Space Program. Aviat Space Environ Med. 2000 Nov;71\(11\):1120-1125.](#)
- [Hamm PB, Nicogossian AE, Pool SL, Wear ML, Billica RD. Design and Current Status of the Longitudinal Study of Astronaut Health. Aviat Space Environ Med. 2000 Jun;71\(6\):564-570.](#)
- [Hamm PB, Billica RD, Johnson GS, Wear ML, Pool SL. Risk of Cancer Mortality Among the Longitudinal Study of Astronaut Health \(LSAH\) Participants. Aviat Space Environ Med. 1998 Feb;69\(2\):142-144.](#)
- [Peterson LE, Pepper LJ, Hamm PB, Gilbert SL. Longitudinal Study of Astronaut Health: Mortality in the Years 1959-1991. Radiat Res. 1993 Feb;133:257-264.](#)